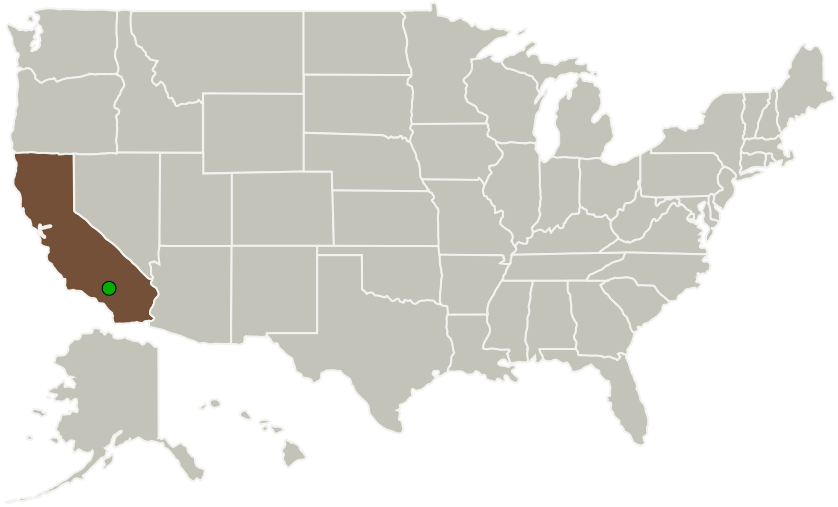
Combustion/Emission Species Monitoring Ground and Flight Aeronautical Research Using a Gas Microsensor Array, Phase II

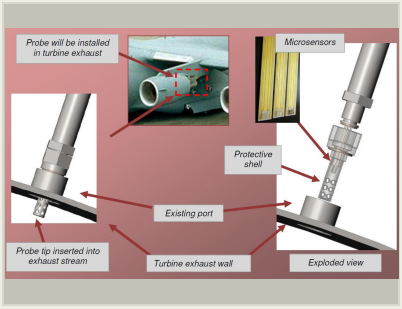
Completed Technology Project (2012 - 2014)

Project Introduction

The goal of this program is to develop a miniaturized and in-situ operated gas microsensor array for the real time monitoring of chemical composition of turbine engine combustors and/or exhaust streams to improve NASA's aeronautical flight test capabilities. Phase II will develop a high temperature microsensor array suitable for incorporation in engines, as installed in aircraft. Sensor arrays developed by our team and research partners have been demonstrated for ground test usage to quantify composition of critical constituents in turbine engine exhaust products, e.g., CO, CO2, NOx, O2 and HC. To date, our research efforts for exhaust monitoring have focused on ground applications, such as installations in stationary rigs for engine development. The goal of the proposed program is to build on knowledge accumulated on ground-based systems to develop a flyable prototype. The program will leverage test opportunities in larger research programs to move through the maturation steps from ground-based to flyable systems. The microsensor array probe, cabling and control electronics will be developed to withstand the harsh environment of an aircraft engine. Initial tests will be performed with the prototype installed the engine of a grounded airplane. Beyond Phase II, full flight tests are envisioned.

Primary U.S. Work Locations and Key Partners





Combustion/Emission Species Monitoring Ground and Flight Aeronautical Research Using a Gas Microsensor Array Project Image

Table of Contents

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Organizations Performing Work	Role	Type	Location
Makel Engineering, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Chico, California
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations
California

Project Transitions

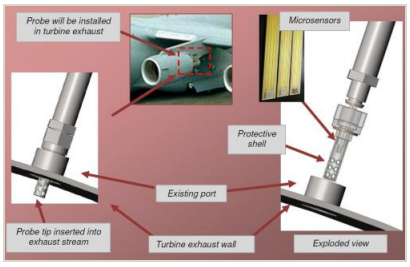
April 2012: Project Start

August 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137968)*

Images



Project Image
Combustion/Emission Species Monitoring Ground and Flight Aeronautical Research Using a Gas Microsensor Array Project Image *(https://techport.nasa.gov/image/132980)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Makel Engineering, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Darby B Makel

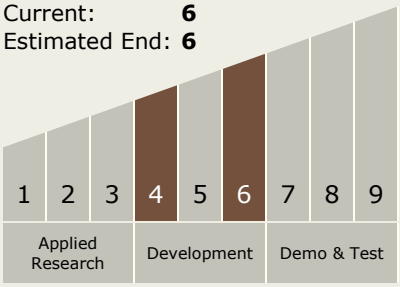
Co-Investigator:
Darby Makel

Combustion/Emission Species Monitoring Ground and Flight Aeronautical Research Using a Gas Microsensor Array, Phase II

Completed Technology Project (2012 - 2014)

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX13 Ground, Test, and Surface Systems
  - TX13.2 Test and Qualification
    - TX13.2.7 Test Instruments and Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System